FUJITSU

SPARC Enterprise
M4000/M5000 Servers

Overview Guide

C120-E346-06EN

FUJITSU

SPARC Enterprise™ M4000/M5000 Servers Overview Guide

Manual Code C120-E346-06EN
Part No.819-7899-13
August 2009, Revision. A

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Preface

The SPARC Enterprise™ M4000/M5000 Servers Overview describes system features, system configurations, hardware functions, and software functions of the SPARC Enterprise M4000/M5000 servers.

This section includes:

- "Glossary" on page ix
- "Structure and Contents of This Manual" on page x
- "SPARC Enterprise M4000/M5000 Servers Documentation" on page x
- "Text Conventions" on page xiii
- "Prompt Notations" on page xiii
- "Syntax of the Command-Line Interface (CLI)" on page xiv
- "Environment Requirements for Using This Product" on page xiv
- "Conventions for Alert Messages" on page xiv
- "Notes on Safety" on page xvi
- "Alert Labels" on page xix
- "Product Handling" on page xx
- "Fujitsu Welcomes Your Comments" on page xxii

Glossary

For the terms used in the "SPARC Enterprise M4000/M5000 Servers Documentation" on page x, refer to the *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers Glossary.*

Structure and Contents of This Manual

This manual is organized as described below:

- CHAPTER 1 System Overview

  Provides an overview of the SPARC Enterprise M4000/M5000 servers.

- CHAPTER 2 System Features and Capabilities

  Describes system features and functions.

- CHAPTER 3 About the Software

  Describes the software.

- Index

  Provides keywords and corresponding reference page numbers so that the reader can easily search for items in this manual as necessary.

SPARC Enterprise M4000/M5000 Servers Documentation

The manuals listed below are provided for reference.

Book Titles	Manual Codes
SPARC Enterprise M4000/M5000 Servers Site Planning Guide	C120-H015
SPARC Enterprise Equipment Rack Mounting Guide	C120-H016
SPARC Enterprise M4000/M5000 Servers Getting Started Guide	C120-E345
SPARC Enterprise M4000/M5000 Servers Overview Guide	C120-E346
Important Safety Information for Hardware Systems	C120-E391
SPARC Enterprise M4000/M5000 Servers Safety and Compliance Guide	C120-E348
External I/O Expansion Unit Safety and Compliance Guide	C120-E457
SPARC Enterprise M4000 Server Unpacking Guide	C120-E349
SPARC Enterprise M5000 Server Unpacking Guide	C120-E350
SPARC Enterprise M4000/M5000 Servers Installation Guide	C120-E351
SPARC Enterprise M4000/M5000 Servers Service Manual	C120-E352

Book Titles	Manual Codes
External I/O Expansion Unit Installation and Service Manual	C120-E329
SPRAC Enterprise M3000/M4000/M5000/M8000/M9000 Servers RCI Build Procedure	C120-E361
SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers Administration Guide	C120-E331
SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers XSCF User's Guide	C120-E332
SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers XSCF Reference Manual	Go to the Web
SPARC Enterprise M4000/M5000/M8000/M9000 Servers Dynamic Reconfiguration (DR) User's Guide	C120-E335
SPARC Enterprise M4000/M5000/M8000/M9000 Servers Capacity on Demand (COD) User's Guide	C120-E336
SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers RCI User's Guide	C120-E360
SPARC Enterprise M4000/M5000 Servers Product Notes	Go to the Web
External I/O Expansion Unit Product Notes	C120-E456
SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers Glossary	C120-E514
SPARC Enterprise/PRIMEQUEST Common Installation Planning Manual	C120-H007

1. Manuals on the Web

   The latest versions of all the SPARC Enterprise Series manuals are available at the following websites.

   Global Site

   http://www.fujitsu.com/sparcenterprise/manual/

   Japanese Site

   http://primeserver.fujitsu.com/sparcenterprise/manual/

Note – Product Notes is available on the website only. Please check for the recent update on your product.

2. Documentation CD

   For the Documentation CD, please contact your local sales representative.

   - SPARC Enterprise M4000/M5000 Servers Documentation CD (C120-E365)

3. Manual included on the Enhanced Support Facility x.x CD-ROM disk

   - Remote maintenance service

Book Title	Manual Code
Enhanced Support Facility User's Guide for REMCS	C112-B067

4. Manual (man page) provided in system

   XSCF man page

Note – The man page can be referenced on the XSCF Shell, and it provides the same content as the *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers XSCF Reference Manual*.

5. Sun Microsystems Software (for Solaris OS, etc.) Related Manuals

   `http://docs.sun.com`

6. Information on Using the RCI function

   The manual does not contain an explanation of the RCI build procedure. For information on using the RCI function, refer to the *SPRAC Enterprise M3000/M4000/M5000/M8000/M9000 Servers RCI Build Procedure* and *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers RCI User's Guide* provided on the website.

Text Conventions

This manual uses the following fonts and symbols to express specific types of information.

Fonts/symbols	Meaning	Example
AaBbCc123	What you type, when contrasted with on-screen computer output. This font represents the example of command input in the frame.	XSCF> **adduser jsmith**
AaBbCc123	The names of commands, files, and directories; on-screen computer output. This font represents the example of command output in the frame.	XSCF> **showuser -p** User Name: jsmith Privileges: useradm auditadm
Italic	Indicates the name of a reference manual	See the *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers XSCF User's Guide*.
" "	Indicates names of chapters, sections, items, buttons, or menus	See Chapter 2, "System Features and Capabilities."

Prompt Notations

The following prompt notations are used in this manual.

Shell	Prompt Notations
XSCF	XSCF>
C shell	machine-name%
C shell super user	machine-name#
Bourne shell and Korn shell	$
Bourne shell and Korn shell super user	#
OpenBoot™ PROM	ok

Syntax of the Command-Line Interface (CLI)

The command syntax is as follows:

- A variable that requires input of a value must be enclosed in <>.
- An optional element must be enclosed in [ ].
- A group of options for an optional keyword must be enclosed in [ ] and delimited by |.
- A group of options for a mandatory keyword must be enclosed in {} and delimited by |.
- The command syntax is shown in a box.

Example:

TABLE 0-1

```
XSCF> showuser -a
```

Environment Requirements for Using This Product

This product is a computer that is intended to be used in a computer room.

For details on the operational environment, see the *SPARC Enterprise M4000/M5000 Servers Site Planning Guide*.

Conventions for Alert Messages

This manual uses the following conventions to show alert messages, which are intended to prevent injury to the user or bystanders as well as property damage, and important messages that are useful to the user.

WARNING:
This indicates a hazardous situation that could result in death or serious personal injury (potential hazard) if the user does not perform the procedure correctly.

CAUTION:
This indicates a hazardous situation that could result in minor or moderate personal injury if the user does not perform the procedure correctly. This signal also indicates that damage to the product or other property may occur if the user does not perform the procedure correctly.

IMPORTANT:
This indicates information that could help the user to use the product more effectively.

Alert messages in the text

An alert message in the text consists of a signal indicating an alert level followed by an alert statement. Alert messages are indented to distinguish them from regular text. Also, a space of one line precedes and follows an alert statement.

WARNING:
The tasks listed below for this product and optional product provided by Fujitsu should be performed only by authorized service personnel.

The user must not perform these tasks. Incorrect operation of these tasks may cause electric shock, injury, or fire.

- Installation and reinstallation of all components
- Removal of front, rear, or side covers
- Mounting/unmounting of optional internal devices
- Connecting/disconnecting of external interface cables
- Maintenance (repair and regular diagnosis and maintenance)

Also, important alert messages are shown in "Important Alert Messages" on page xvi.

Notes on Safety

Important Alert Messages

This manual provides the following important alert signals:

Caution – The WARNING signal indicates a dangerous situation could result in death or serious injury if the user does not perform the procedure correctly.

Task	Warning
Normal operation	**Electric shock, fire** Do not damage, break, or modify the power cords. Cord damage may cause electric shock or fire.

Caution – The CAUTION signal indicates a hazardous situation could result in minor or moderate personal injury if the user does not perform the procedure correctly. This signal also indicates that damage to the product or other property may occur if the user does not perform the procedure correctly.

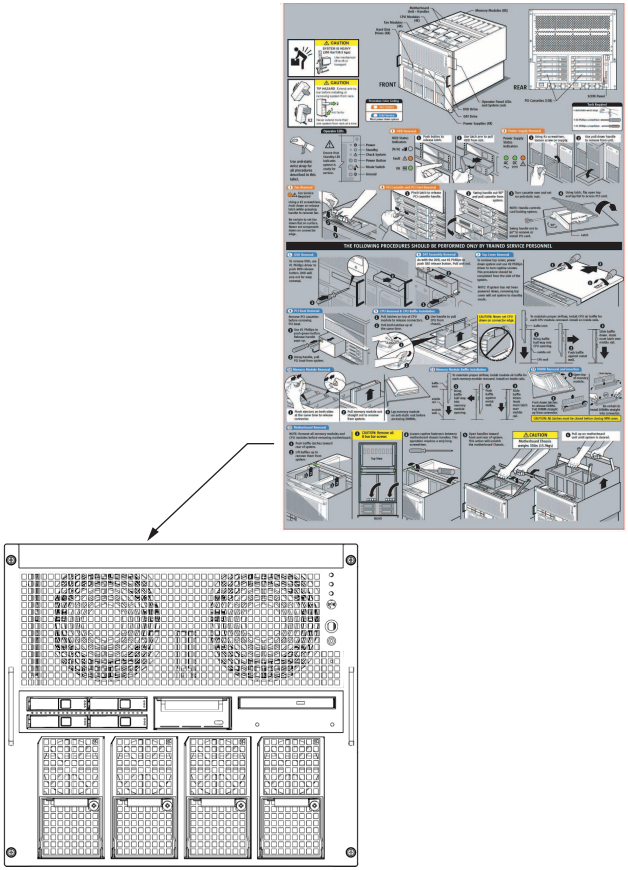
Task	Warning
Normal operation	**Equipment damage** Be sure to follow the precautions below when installing the main unit. Otherwise, the equipment may be damaged. • Do not block ventilation slits. • Avoid installing the equipment in a place exposed to direct sunlight or near equipment that becomes extremely hot. • Avoid installing the equipment in a dusty place or a place directly exposed to corrosive gas or salty air. • Avoid installing the equipment in a place exposed to strong vibration. Also, install the equipment on a level surface so that it is stable. • The equipment can be grounded using shared grounding. However, the grounding method varies with the building where it is installed. Be sure to confirm the related standards to ground the equipment correctly. • Do not run any cable beneath any equipment. Also, prevent cables from becoming taut. Never disconnect any power cord from the equipment while power is being supplied to the equipment. • Do not place anything on top of the main unit. Do not use the main unit as a workspace. • Avoid exposing the equipment to rapid changes in the ambient temperature, such as a rapid increase during transport in winter. A rapid increase in the ambient temperature causes moisture to condense in the equipment. Use the equipment only after the difference between its temperature and the ambient temperature is negligible. • Avoid installing the equipment near a copy machine, air conditioner, or welding machine, which is noisy. • Take preventive action to minimize static electricity at the installation location. Note that static electricity is easily generated in some carpets and can cause the equipment to malfunction. • Confirm that the power supply voltage and frequency during operation match the rated values indicated on the equipment. • Do not insert any object into an opening in the equipment. Components inside the equipment use high voltage. Conductive foreign matter, such as a metal object, inserted into the equipment, may cause a short circuit between components, resulting in fire, electric shock, or equipment damage. • For maintenance of the equipment, contact your authorized service personnel.

Task	Warning
Normal operation	**Data destruction** Confirm the items listed below before turning off the power. Otherwise, data may be destroyed. • All applications have completed processing. • No user is using the equipment. • When the main unit power is turned off, the POWER LED on the operation panel is turned off. Be sure to confirm that the POWER LED is off before turning off the main power (uninterruptible power supply [UPS], power distribution box, etc.). If necessary, back up files before turning off the system power. **Data destruction** Do not forcibly stop a domain that is operating normally. Otherwise, data may be destroyed. **Data destruction** Do not disconnect the power cord from the AC power input while power is being supplied. Otherwise, data stored on hard disk units may be destroyed.

Alert Labels

The followings are labels attached to this product:

- Never peel off the labels..



SPARC Enterprise M5000 (Front View)

Product Handling

Maintenance

Caution – Certain tasks in this manual should only be performed by a certified service engineer. User must not perform these tasks. Incorrect operation of these tasks may cause electric shock, injury, or fire.

- Installation and reinstallation of all components, and initial settings
- Removal of front, rear, or side covers
- Mounting/de-mounting of optional internal devices
- Plugging or unplugging of external interface cards
- Maintenance and inspections (repairing, and regular diagnosis and maintenance)

Caution – The following tasks regarding this product and the optional products provided from Fujitsu should only be performed by a certified service engineer. Users must not perform these tasks. Incorrect operation of these tasks may cause malfunction.

- Unpacking optional adapters and such packages delivered to the users
- Plugging or unplugging of external interface cards

Remodeling/Rebuilding

Caution – Any modification and/or recycling of this product and its components may be carried out only by a certified service engineer and must not be done by the customer under any circumstances. Otherwise, electric shock, injury or fire may result.

Emission of Laser Beam (Invisible)

Caution – The main unit contains modules that generate invisible laser radiation. Laser beams are generated while the equipment is operating, even if an optical cable is disconnected or a cover is removed. Do not look at any light-emitting part directly or through an optical apparatus (e.g., magnifying glass, microscope).

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For Users in Other Countries:

SPARC Enterprise contact

http://www.fujitsu.com/global/contact/computing/sparce_index.html

CHAPTER 1

System Overview

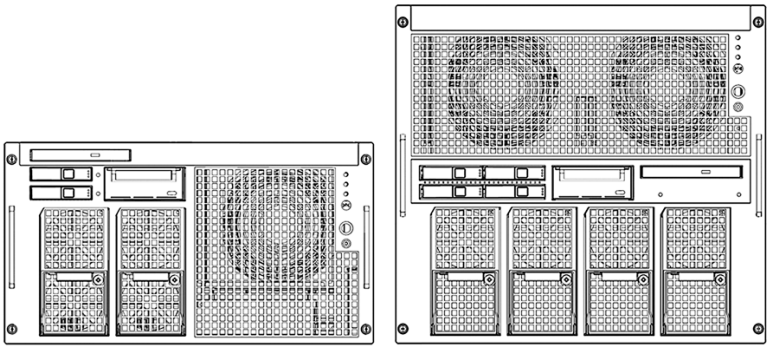
This chapter provides information on the hardware and software features and configurations for the SPARC Enterprise™ M4000/M5000 midrange servers. This chapter contains these sections.

- Section 1.1, “Product Overview” on page 1-1
- Section 1.2, “Features” on page 1-2
- Section 1.3, “Components” on page 1-9
- Section 1.4, “I/O Options” on page 1-32
- Section 1.5, “Software Features” on page 1-32

1.1 Product Overview

Both midrange servers are based on the SPARC64™ VI/SPARC64™ VII processors.

FIGURE 1-1 SPARC Enterprise M4000 Server [left] and SPARC Enterprise M5000 Server [right] (Front Views)



1.2 Features

TABLE 1-1 provides features for fully configured servers. For more detailed specifications on each component, see Section 1.3, “Components” on page 1-9. For specifications of equipment racks, refer to the technical information manual for your equipment rack.

TABLE 1-1 Server Features

Features	SPARC Enterprise M4000 Server	SPARC Enterprise M5000 Server
Motherboard unit	1	1
CPU	Type: SPARC64 VI 2 CPU modules, 8 processor cores	Type: SPARC64 VI 4 CPU modules, 16 processor cores
	Type: SPARC64 VII 2 CPU modules, 16 processor cores	Type: SPARC64 VII 4 CPU modules, 32 processor cores
Memory board (4 or 8 DIMMs per memory board)	4 (32 DIMMs total)	8 (64 DIMMs total)
I/O unit (IOU)	1	2

TABLE 1-1 Server Features *(Continued)*

Features	SPARC Enterprise M4000 Server	SPARC Enterprise M5000 Server
PCI slots	5 slots per tray in the IOU 1 IOU (5 cassettes)	5 slots per tray in the IOU 2 IOUs (10 cassettes)
PCI cards	5 (1 PCI-X and 4 PCI-Express)	10 (2 PCI-X and 8 PCI-Express)
eXtended System Control Facility Unit (XSCFU)	1	1
Power supplies (2000W)	2 (1+ 1 redundant @200 VAC)	4 (2 + 2 redundant @200 VAC)
Redundant cooling	• Two 172-mm fans (One fan is redundant) • Two 60-mm fans (One fan is redundant)	Four 172-mm fans per server Two fans are redundant
Internal drives	1 CD-RW/DVD-RW drive unit, 2 hard disk drives, 1 tape drive unit (optional)*	1 CD-RW/DVD-RW drive unit, 4 hard disk drives, 1 tape drive unit (optional)
Domains	2	4
Architecture	Platform group: sun4u Platform name: SUNW, SPARC-Enterprise	
Rackmountable	Equipment rack	
Server dimensions (width x depth x height)	444 x 810 x 263 mm (6 rack units) 17.5 x 31.9 x 10.3 inches	444 x 810 x 440 mm (10 rack units) 17.5 x 31.9 x17.3 inches
Weight	185 lb. (84 kg)	275 lb. (125 kg)

* Contact your sales representative for tape drive unit options on SPARC Enterprise M4000/M5000 servers.

The environmental requirements listed in TABLE 1-2 reflect the test results of the server. The optimum conditions indicate the recommended operating environment. Operating the server for extended periods at or near the operating range limits or installing the server in an environment where it remains at or near the non-operating

range limits could possibly increase the failure rate of hardware components significantly. In order to minimize the occurrence of system failure due to component failure, set temperature and humidity in the optimal ranges.

TABLE 1-2 Environmental Requirements

	Operating Range	Non-Operating Range	Optimum
Ambient temperature	5°C to 35°C (41°F to 95°F)	Unpacked: 0°C to 50°C (32°F to 122°F) Packed: -20°C to 60°C (-4°F to 140°F)	21°C to 23°C (70°F to 74°F)
Relative humidity *	20% RH to 80% RH	to 93% RH	45% RH to 50% RH
Altitude restriction †	3,000 m (10,000 ft)	12,000 m (40, 000 ft)	
Temperature conditions	5°C to 35°C (41°F to 95°F): 0 m to 500 m (0 ft to 1,640 ft)		
	5°C to 33°C (41°F to 91.4°F): 501 m to 1,000 m (1,644 ft to 3,281 ft)		
	5°C to 31°C (41° Fto 87.8°F): 1,001 m to 1,500 m (3,284 ft to 4,921 ft)		
	5°C to 29°C (41°F to 84.2°F): 1,501 m to 3,000 m (4,925 ft to 9,843 ft)		

* There is no condensation regardless of the temperature and humidity.

† All altitudes are above sea level.

Note – In order to minimize any chance of downtime due to component failure, use the optimal temperature and humidity ranges.

Both midrange servers have these features:

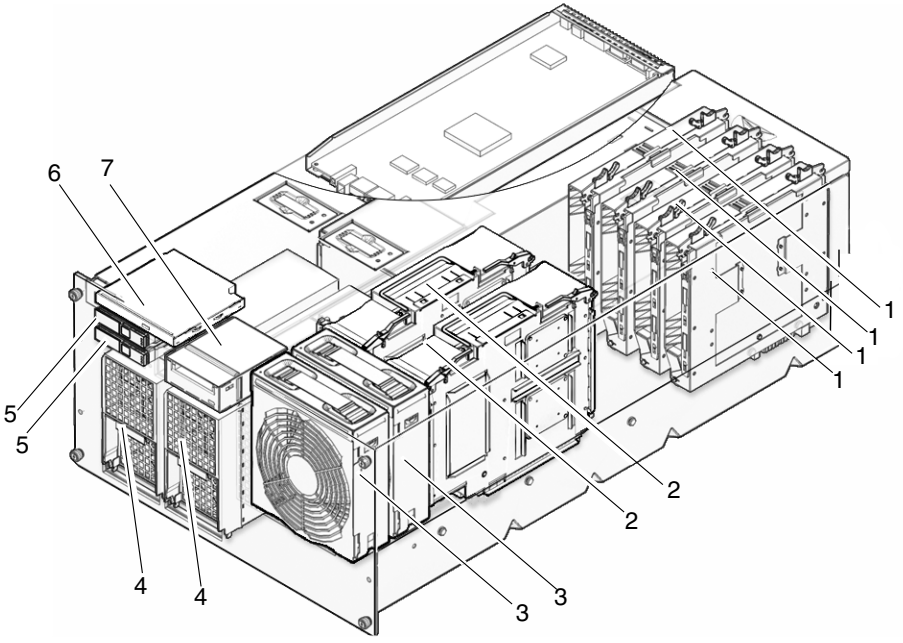
- Rackmountable
- Support for multiple CPU modules
- Symmetric multiprocessing (SMP), which is making multiple CPUs available to complete individual processes simultaneously
- eXtended System Control Facility Unit (XSCFU)
- PCI-Express I/O bus

- PCI cassettes
- Operator panel
- Hard disk drives, CD-RW/DVD-RW drive unit, tape drive unit (optional)
- Redundant power and cooling
- Hot FRU replacement capability
- I/O expandability with the External I/O Expansion Unit

1.2.1 SPARC Enterprise M4000 Server

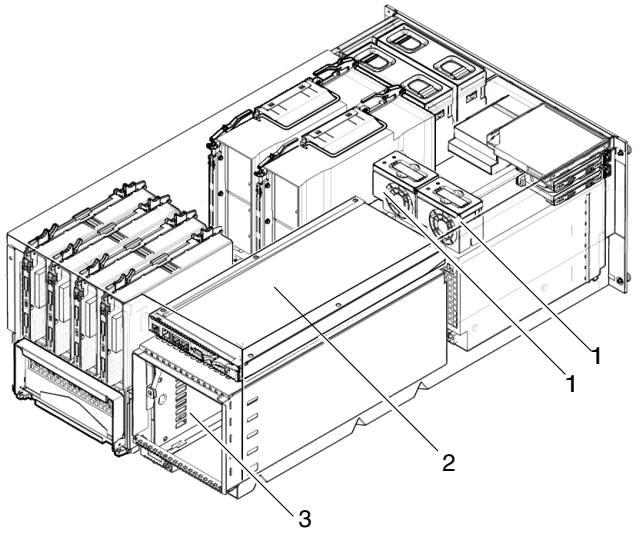
The SPARC Enterprise M4000 server is a six-rack unit (6 RU) enclosure (10.35 inches, 263 mm), which supports up to two dynamic server domains. FIGURE 1-2 and FIGURE 1-3 illustrate the components. See Section 1.3, "Components" on page 1-9 for a brief description of each component.

FIGURE 1-2 SPARC Enterprise M4000 Server (Internal Front View)



Location Number	Component	Maximum Number per Server
1	Memory boards (MEMB)	4
2	CPU modules each containing two processor chips (CPUM)	2
3	172-mm fans (FAN_A)	2
4	Power supply units (PSU)	2
5	Hard disk drives (HDD), Serial-attached SCSI (SAS)	2
6	CD-RW/DVD-RW drive unit (DVDU)	1
7	Tape drive unit (TAPEU), optional	1

FIGURE 1-3 SPARC Enterprise M4000 Server (Internal Rear View)

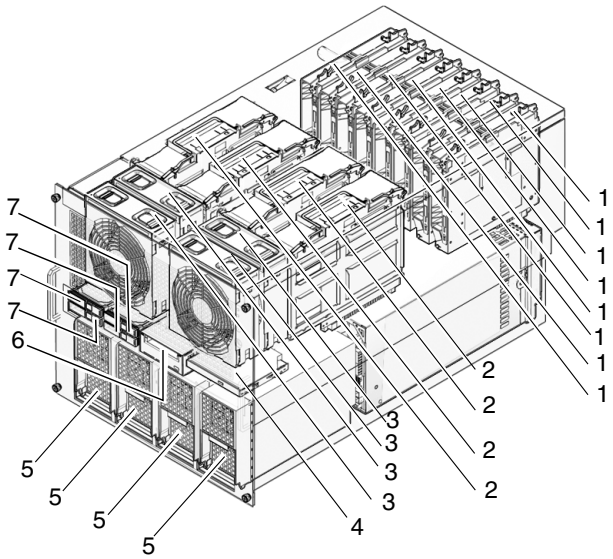


Location Number	Component	Maximum Number per Server
1	60-mm fans (FAN_B)	2
2	eXtended System Control Facility unit (XSCFU)	1
3	I/O unit—supports one PCI-X slot (lowest slot) and four PCIe slots (four upper slots)	1

1.2.2 SPARC Enterprise M5000 Server

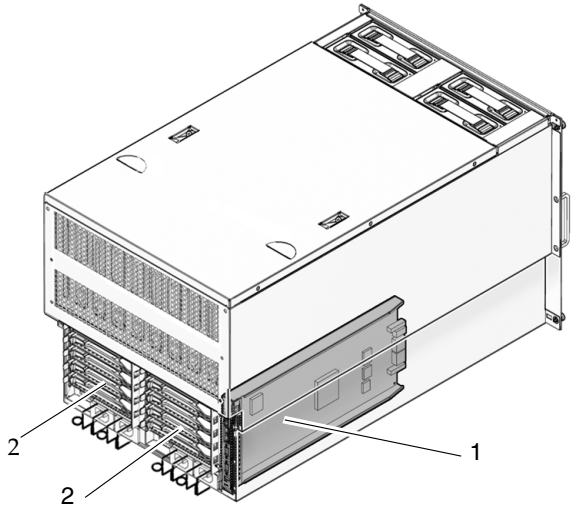
The SPARC Enterprise M5000 server is a ten-rack unit (10 RU) enclosure (17.25 inches, 438 mm), which supports up to four dynamic server domains. FIGURE 1-4 and FIGURE 1-5 illustrates the components. See Section 1.3, "Components" on page 1-9 for a brief description of each component.

FIGURE 1-4 SPARC Enterprise M5000 Server (Internal Front View)



Location Number	Component	Maximum Number per Server
1	Memory boards (MEMB)	8
2	CPU modules each containing two processor chips (CPUM)	4
3	172-mm fans (FAN_A)	4
4	CD-RW/DVD-RW drive unit (DVDU)	1
5	Power supply units (PSU)	4
6	Tape drive unit (TAPEU), optional	1
7	Hard disk drives (HDD), Serial-attached SCSI (SAS)	4

FIGURE 1-5 SPARC Enterprise M5000 Server (Rear View)



Location Number	Component	Maximum Number per Server
1	eXtended System Control Facility Unit (XSCFU)	1
2	I/O unit (IOU) Each I/O unit supports one PCI-X slot (lowest slot) and four PCIe slots (four upper slots)	2

1.2.3 Operator Panel Overview

The operator panel, which is identical for both midrange servers, is located on the front of the server in the upper right corner. The operator panel is used for the following tasks:

- Displaying the server status
- Storing server identification information
- Storing user setting information
- Turning on the power supply of all domains
- Changing operational and maintenance mode by using the mode switch

See Section 1.3.6, “Operator Panel” on page 1-21 for a description of the LEDs and status indicators.

For complete details on the operator panel controls, refer to the *SPARC Enterprise M4000/M5000 Servers Service Manual.*

1.3 Components

The components of both midrange servers are described in the following sections:

- Section 1.3.1, "Motherboard Unit" on page 1-10
- Section 1.3.2, "CPU Module" on page 1-11
- Section 1.3.3, "Memory Board" on page 1-13
- Section 1.3.4, "Fan Unit" on page 1-15
- Section 1.3.5, "Power Supply" on page 1-18
- Section 1.3.6, "Operator Panel" on page 1-21
- Section 1.3.7, "eXtended System Control Facility Unit (XSCFU)" on page 1-24
- Section 1.3.8, "I/O Unit" on page 1-27
- Section 1.3.9, "On-Board Drive Units" on page 1-29
- Section 1.4.1, "External I/O Expansion Unit" on page 1-32

TABLE 1-3 identifies the FRU components. Components using "hot FRU replacement" can be removed from the server and replaced while the operating server is running without performing a dynamic reconfiguration operation. Components using "active FRU removal" must be dynamically reconfigured out of the domain before removing the component.

TABLE 1-3 FRU Components for Both Midrange Servers

Component	Redundant	Cold Replacement	Hot Replacement	Active Replacement
Motherboard unit	No	Yes		
CPU module	No	Yes		
Memory board	No	Yes		
DIMM	No	Yes		
eXtended System Control Facility unit (XSCFU)	No	Yes		
I/O Unit	No	Yes		
PCI cassette with PCI card	No	Yes	Yes	Yes
Fan unit	Yes	Yes	Yes	Yes
Fan backplane	No	Yes		

TABLE 1-3 FRU Components for Both Midrange Servers *(Continued)*

Component	Redundant	Cold Replacement	Hot Replacement	Active Replacement
Power supply unit	Yes	Yes	Yes	Yes
Bus bar, I/O backplane, and power backplane unit (SPARC Enterprise M5000 server)	No	Yes		
I/O backplane and power backplane unit (SPARC Enterprise M4000 server)	No	Yes		
Hard disk drive	No	Yes	Yes	Yes
Tape drive unit (optional)	No	Yes	Yes	Yes
CD-RW/DVD-RW drive unit	No	Yes	Yes	
Operator panel	No	Yes		

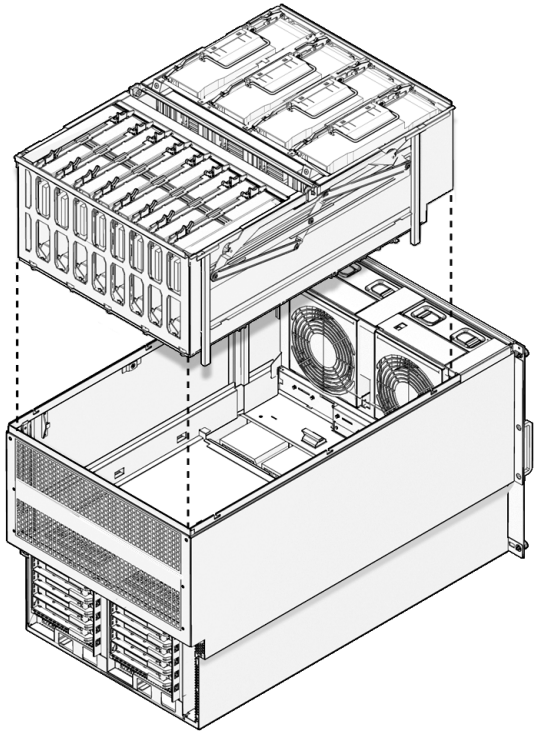
1.3.1 Motherboard Unit

The motherboard unit (FIGURE 1-6) is the main circuit board in both midrange servers. The following components connect to the motherboard unit:

- CPU modules (two CPU chips per module)
- Memory boards
- Bus bar, I/O backplane, and power backplane unit (SPARC Enterprise M5000 server only)
- I/O unit(s) through the I/O backplane
- eXtended System Control Facility Unit (XSCFU) through the bus bar, I/O backplane, and power backplane unit

To remove and replace the motherboard and these components, you must power the server off. For more details on the motherboard unit, refer to the *SPARC Enterprise M4000/M5000 Servers Service Manual*.

FIGURE 1-6 Removing the Motherboard Unit From the SPARC Enterprise M5000 Server



1.3.2 CPU Module

Each CPU module contains SPARC64 VI processors or SPARC64 VII processors. Each processor chip incorporates and implements the following:

- Chip multithreading (CMT) design that sequentially executes the multiple processes on the CPU.
- SPARC64 VI processors are two-core processors.
- SPARC64 VII processors are four-core processors.

The CPU modules can be accessed from the top of the midrange server. FIGURE 1-7 and FIGURE 1-8 illustrate the number of CPU modules per midrange server and their location. TABLE 1-4 lists features of the CPU modules. For additional information on the CPU module, refer to the *SPARC Enterprise M4000/M5000 Servers Service Manual*.

TABLE 1-4 CPU Module Features

CPU module location	Top of server
Cold FRU replacement capability	Yes

FIGURE 1-7 CPU Modules in the SPARC Enterprise M4000 Server

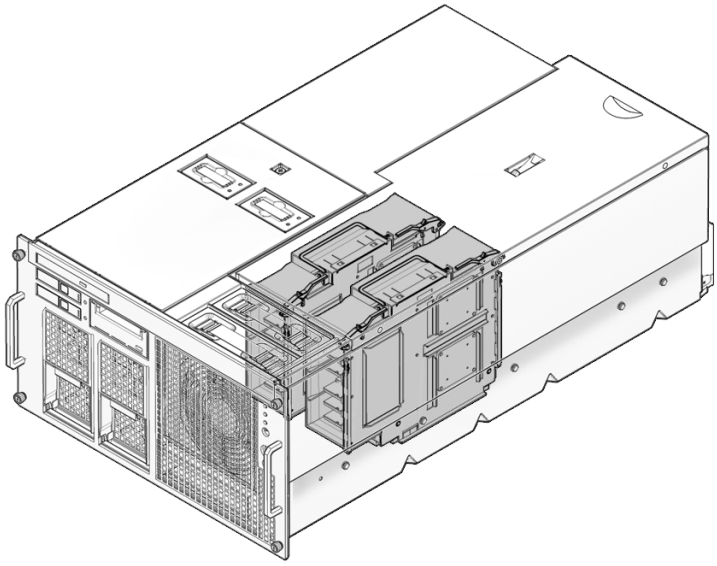
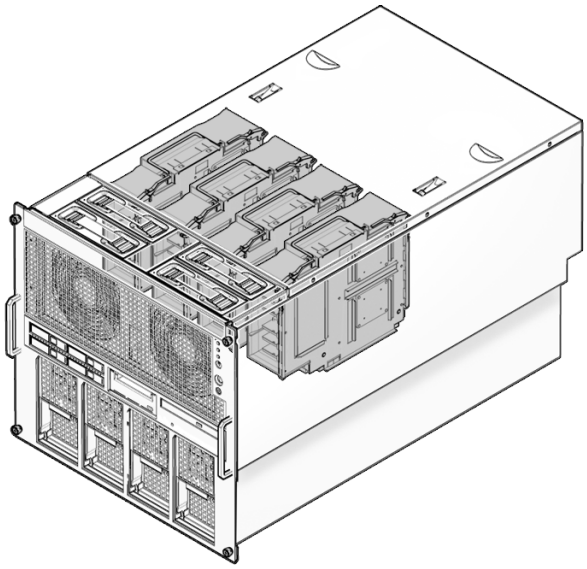


FIGURE 1-8 CPU Modules in the SPARC Enterprise M5000 Server



1.3.3 Memory Board

Each memory board provides a memory access controller (MAC) and eight DIMM slots (FIGURE 1-9 and FIGURE 1-10). To remove or install memory boards, you must power the server off. TABLE 1-5 lists the memory board features.

TABLE 1-5 Memory Board Features

Location	Top of server
Cold FRU replacement capability	Yes

To install DIMMs, you must remove the memory board and open the case of the memory board. The servers use Double Data Rate II (DDR-II) type memory with the following features:

- Error Checking and Correction (ECC) error protection
- Recovery from memory chip failures

FIGURE 1-9 and FIGURE 1-10 illustrate the location of the memory boards in both midrange servers.

FIGURE 1-9 Memory Board Location in the SPARC Enterprise M4000 Serve

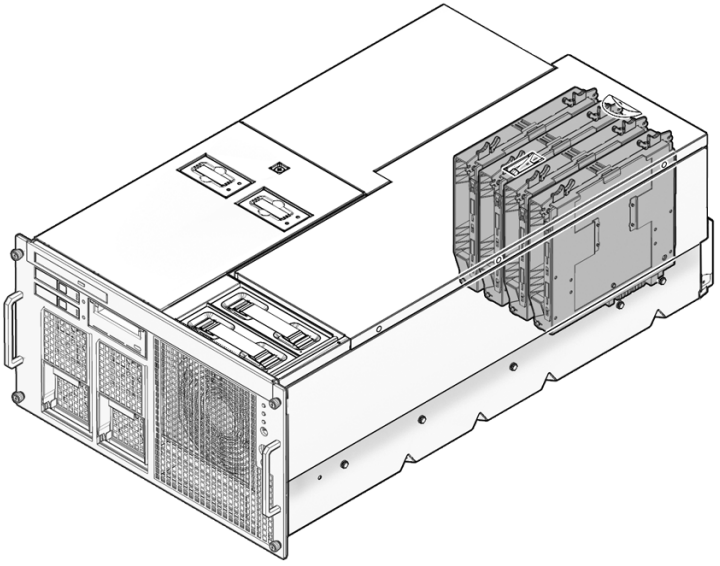
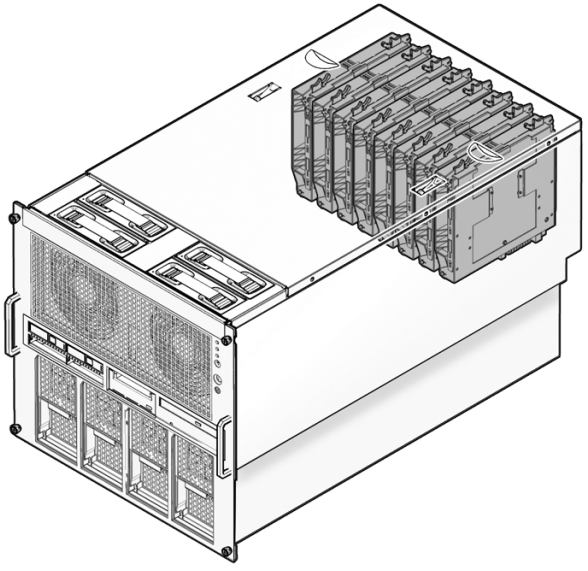


FIGURE 1-10 Memory Board Location in the SPARC Enterprise M5000 Server



1.3.4 Fan Unit

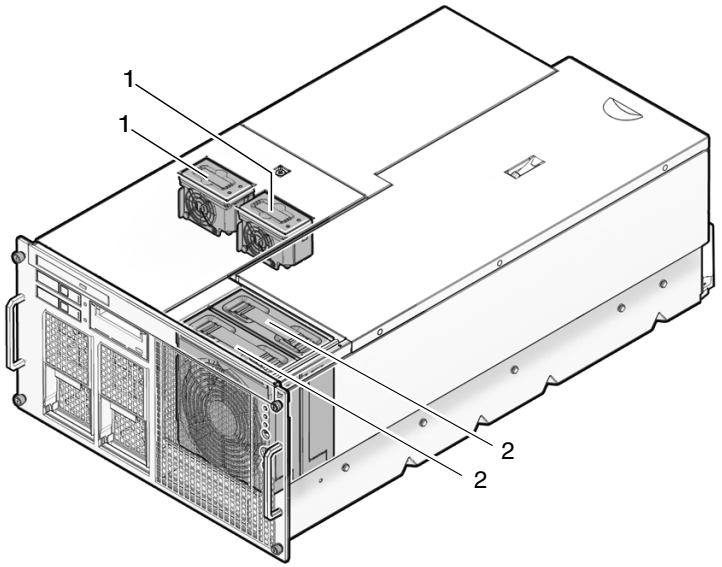
Both midrange servers use 172-mm fan units as the primary cooling system. The SPARC Enterprise M4000 server also use two 60-mm fans. FIGURE 1-11 and FIGURE 1-12 illustrate the number of fans per midrange server, fan location, and the fan types used in both midrange servers.

The fan units in both midrange servers move air currents into and out of the server. The fans in both midrange servers are redundant. Because of the redundancy, system operation continues when a failure occurs with one fan. If the midrange server has two fans of each fan type, one fan of each fan type is redundant. If the midrange server has a total of four fans, two of the four fans are redundant (FIGURE 1-11 and FIGURE 1-12). Fan failures can be detected by the eXtended System Control Facility (XSCF).

The fans are accessed from the top of the midrange server.

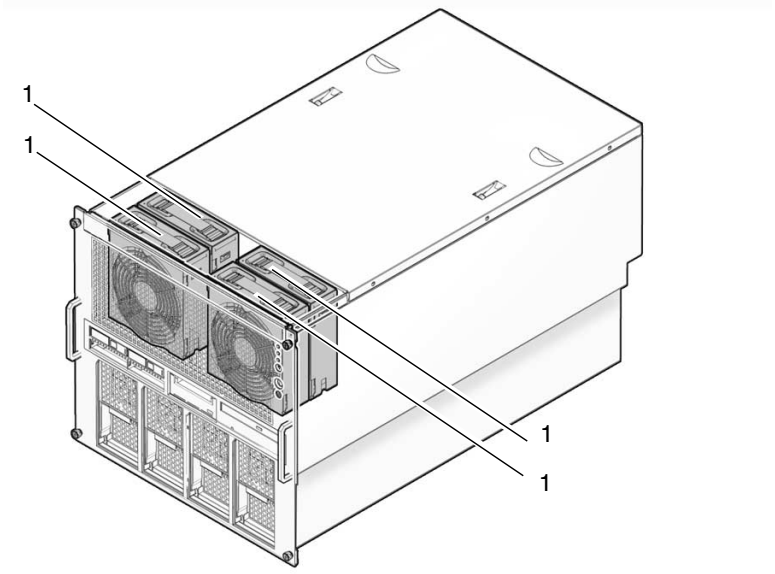
FIGURE 1-11 and FIGURE 1-12 show the fan unit locations in both midrange servers.

FIGURE 1-11 Fan Unit Locations in the SPARC Enterprise M4000 Server



Location Number	Component	Maximum Number per Server
1	Fan units, 60-mm (FAN_B#0, FAN_B#1)	2
2	Fan units, 172-mm (FAN_A#0, FAN_A#1)	2

FIGURE 1-12 172-mm Fan Unit Locations in the SPARC Enterprise M5000 Server

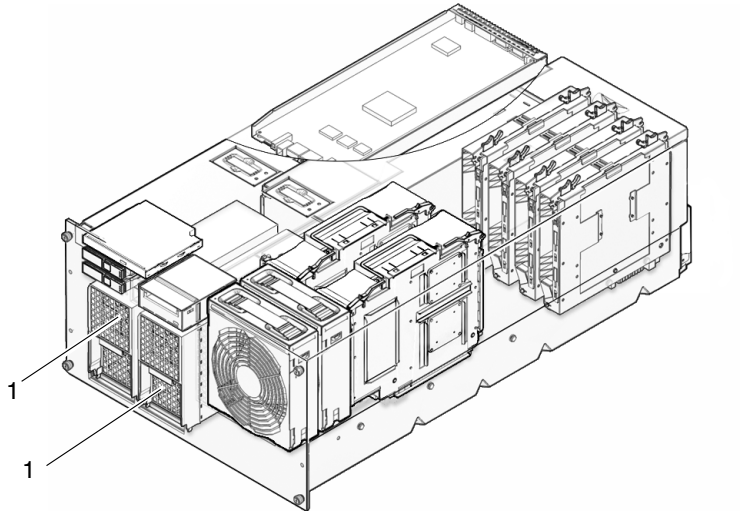


Location Number	Component	Maximum Number per Server
1	Fan units, 172-mm (FAN_A#0 - FAN_A#3)	4

1.3.5 Power Supply

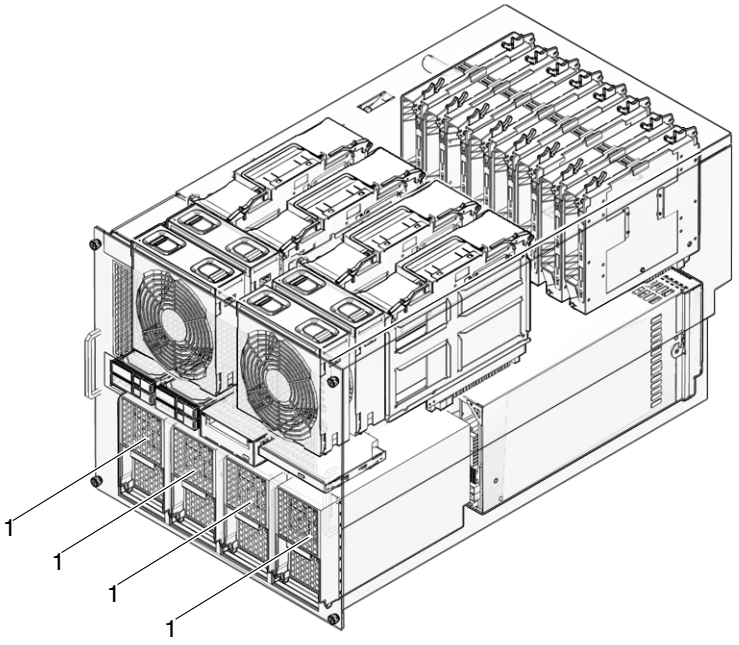
Power is provided to both midrange servers by power supply units (FIGURE 1-13 and FIGURE 1-14).

FIGURE 1-13 Power Supply Units in the SPARC Enterprise M4000 Server



Location Number	Component	Maximum Number per Server
1	Power supply units	2

FIGURE 1-14 Power Supply Units in the SPARC Enterprise M5000 Server



Location Number	Component	Maximum Number per Server
1	Power supply units	4

The redundant power supplies allow continued server operation if a power supply fails. You can remove a power supply by way of active replacement, cold replacement, or hot replacement.

TABLE 1-6 lists the power supply features and some specifications. For additional specifications, refer to the *SPARC Enterprise M4000/M5000 Servers Site Planning Guide*.

TABLE 1-6 Midrange Servers Electrical Specifications

	SPARC Enterprise M4000	SPARC Enterprise M5000
Number of Power Cords	2 (1 power cord per power supply unit)	4 (1 power cord per power supply unit)
Redundancy	1 + 1 redundant Second power supply is redundant at 200 VAC	2 + 2 redundant Second and fourth power supplies are redundant at 200 VAC
Input voltage	100–127 VAC 200–240 VAC	100–127 VAC 200–240 VAC
Maximum current	24.0A at 100–127 VAC (12A/cord) 12.0A at 200–240 VAC (12A/cord)	48A at 100–127 VAC (12A/cord) 24A at 200–240 VAC (12A/cord)
Frequency	50–60 Hz	50–60 Hz
Power factor	0.98	0.98

CPU Types and Server Maximum Power Consumption

This section describes the CPU types and the maximum power consumption of the server.

There are three types of CPU. The power specifications of the SPARC Enterprise M4000/M5000 servers vary depending on the CPU type and the system configuration.

TABLE 1-7 and TABLE 1-8 list the specifications of maximum power consumption, apparent power, and heat dissipation by the type of CPU. The figures represent the system configuration described below the table, in which every CPU Modules (CPUM) is mounted with the same CPU.

TABLE 1-7 Power Consumption Example for an M4000 System*

CPU type	Frequency (GHz)	Number	Power Consumption (W)	Apparent Power (VA)	Heat Dissipation (KJ/h)
SPARC 64 VI processor	2.15	4	1556	1620	5600
SPARC 64 VII processor	2.4	4	1656	1725	5960
	2.53	4	1656	1725	5960

* M4000 system configuration: CPUM x 2, MEMB x 4, 4GB DIMM x 32, HDD x 2, PCIe x 4, PCI-X x 1, DAT x 1.

TABLE 1-8 Power Consumption Example for an M5000 System*

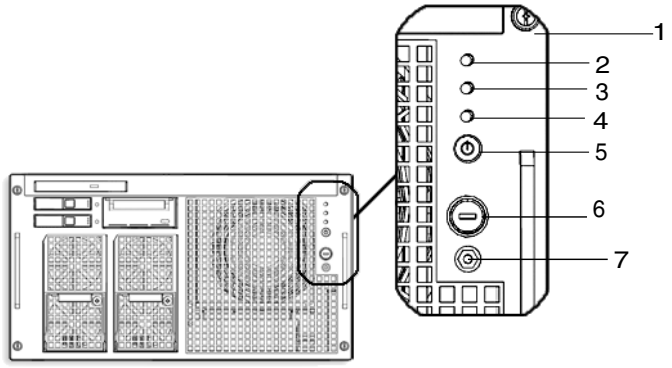
CPU type	Frequency (GHz)	Number	Power Consumption (W)	Apparent Power (VA)	Heat Dissipation (KJ/h)
SPARC 64 VI processor	2.15	8	2998	3123	10791
SPARC 64 VII processor	2.4	8	3198	3331	11511
	2.53	8	3198	3331	11511

* M5000 system configuration: CPUM x 4, MEMB x 8, 4GB DIMM x 64, HDD x 4, PCIe x 8, PCI-X x 2, DAT x 1.

1.3.6 Operator Panel

The operator panel (FIGURE 1-15), which is not redundant, displays the system status, system problem alerts, and location of system faults. It also stores the system identification and user setting information. For more information on the operator panel functions, refer to the *SPARC Enterprise M4000/M5000 Servers Service Manual*.

FIGURE 1-15 Operator Panel



Location Number	Function
1	Operator panel (FRU)
2	POWER LED
3	XSCF STANDBY LED
4	CHECK LED
5	Power switch
6	Mode switch (keyswitch)
7	Antistatic ground socket

During startup, the front panel LED status indicators are individually toggled on and off to verify that each component is working correctly. After startup, the front panel LED status indicators operate as described in TABLE 1-9.

TABLE 1-9 Operator Panel LEDs and Switches

Icon	Name	Color	Description
	POWER LED	Green	Indicates the server power status. • On: Server has power. • Off: Server is without power. • Blinking: The power-off sequence is in progress.
XSCF	XSCF STANDBY LED	Green	Indicates the readiness of the XSCF. • On: XSCF unit is functioning normally. • Off: XSCF unit is stopped. • Blinking: Under system initialization after server power-on, or under system power-on process.
	CHECK LED	Amber	Indicates that server detected a fault. • On: Error detected that disables the startup. • Off: Normal, or the server is power-off (power failure). • Blinking: Indicates the position of fault.
	Power switch		Button to direct server power on/power off.
	Mode switch (key switch)		The Locked setting: • Normal key position. Power on is available with the Power switch, but power off is not. • Disables the Power switch to prevent unauthorized users from powering the server on or off. • The Locked position is the recommended setting for normal day-to-day operations.
		-	The Service setting: • Service should be provided at this position. • Power on and off is available with Power switch. • The key cannot be pulled out at this position.

LED status indicators are located on some of the FRUs. For information about LED status indicator locations, refer to the *SPARC Enterprise M4000/M5000 Servers Service Manual*.

TABLE 1-10 Status Indicator LED Pattern Summary

LED			
POWER	**XSCF STANDBY**	**Check**	**Description of the state**
Off	Off	Off	The circuit breaker is switched off.
Off	Off	On	The circuit breaker is switched on.
Off	Blinking	Off	The XSCF is being initialized.
Off	Blinking	On	An error occurred in the XSCF.
Off	On	Off	The XSCF is on standby. The system is waiting for power-on of the air conditioning system.
On	On	Off	Warm-up standby processing is in progress (power-on is delayed). The power-on sequence is in progress. The system is in operation.
Blinking	On	Off	The power-off sequence is in progress. Fan termination is being delayed.

1.3.7 eXtended System Control Facility Unit (XSCFU)

The eXtended System Control Facility Unit (XSCFU) is a service processor that operates and administrates both midrange servers (FIGURE 1-16 and FIGURE 1-17).The XSCFU diagnoses and starts the entire server, configures domains, offers dynamic reconfiguration, as well as detects and notifies various failures. The XSCFU enables standard control and monitoring function through network. Using this function enables starts, settings, and operation managements of the server from remote locations.

FIGURE 1-16 XSCFU Location in the SPARC Enterprise M4000 Server

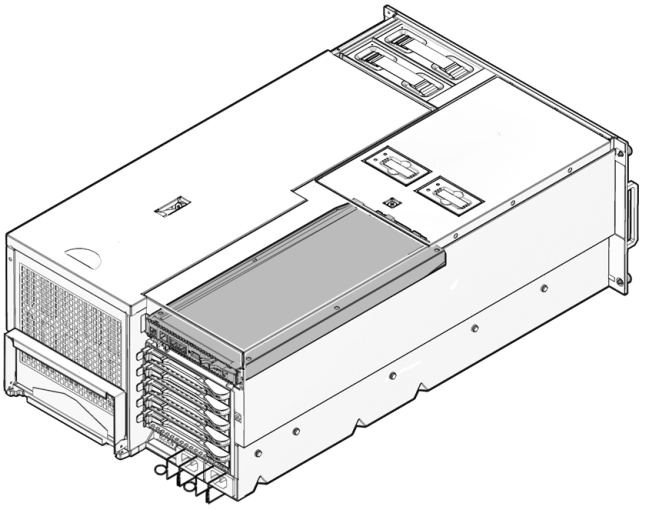
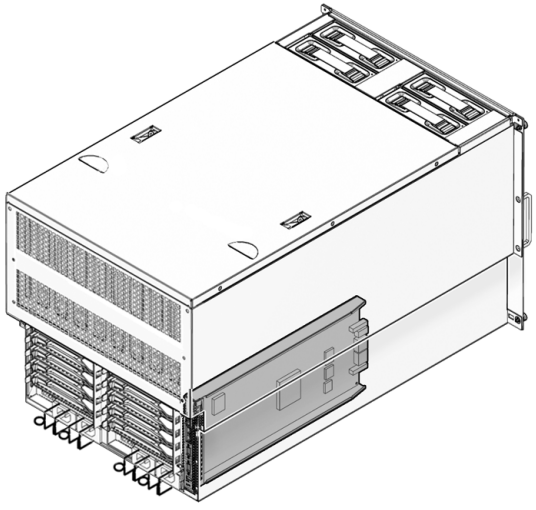


FIGURE 1-17 XSCFU Location in the SPARC Enterprise M5000 Server



The XSCFU uses the eXtended System Control Facility (XSCF) firmware to provide the following functions:

- Controls and monitors the main unit hardware
- Monitors the Solaris™ Operating System (Solaris OS), power-on self-test (POST), and the OpenBoot™ PROM
- Controls and manages the interface for the system administrator (such as a terminal console)
- Administrators device information
- Controls remote messaging of various events

Both midrange servers have one XSCFU, which is serviced from the rear of the server. To replace it, you must power off the server. For more information, refer to the *SPARC Enterprise M4000/M5000 Servers Service Manual*.

The XSCF firmware provides the system control and monitoring interfaces listed below.

- Serial port through which the command-line interface (XSCF Shell) can be used
- Two LAN ports:
  - XSCF Shell
  - XSCF Web (browser-based user interface)

The following additional interfaces for system control are also provided:

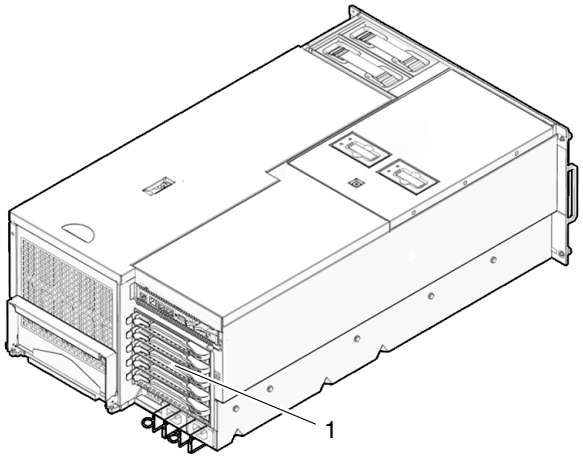
- The uninterruptible power supply unit (UPC) interface ports (2), which are used to communicate to uninterruptible power supply units (UPS).

  A UPS unit is used to provide a stable supply of power to the system in the event of a power failure or an extensive power interruption. By connecting the UPC port of the server and a UPS which has a UPC interface via signal cables, you can execute emergency shutdown processing when the commercial AC power supply failure detected.
- RCI port, which is used for power supply synchronization through a connected remote cabinet interface (RCI) device.
- USB interface port for maintenance operator
  - This is dedicated for use by field engineers and cannot be connected to general-purpose USB devices.

1.3.8 I/O Unit

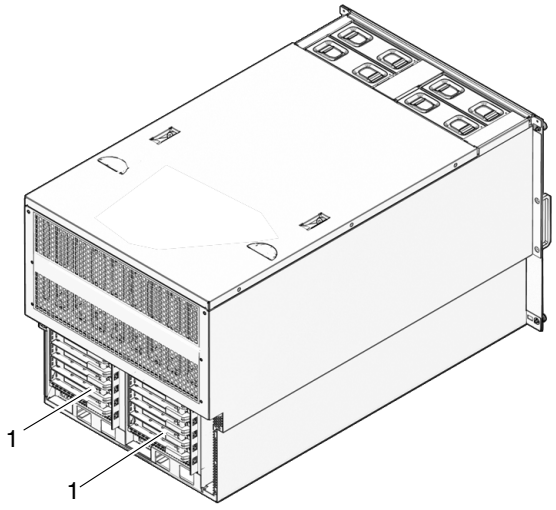
The I/O unit is illustrated in FIGURE 1-18 and FIGURE 1-19. Four PCI Express (PCIe) buses are connected from one I/O controller. These buses support all of the systems on-board I/O controllers in addition to the interface cards in the server.

FIGURE 1-18 I/O Unit Location in the SPARC Enterprise M4000 Server



Location Number	Component	Maximum Number per Server
1	I/O unit	1

FIGURE 1-19 I/O Unit Locations in the SPARC Enterprise M5000 Server



Location Number	Component	Maximum Number per Server
1	I/O unit	2

The I/O unit (IOU) is used in both the midrange servers. Refer to the *SPARC Enterprise M4000/M5000 Servers Service Manual* for more information on the IOU.

The IOU houses the following:

- Four PCIe 8lane, x8 short card slots (four upper slots)
- One PCI-X short card slot (lowest slot)

The IOU holds cassettes that support four PCIe cards and one PCI-X card.

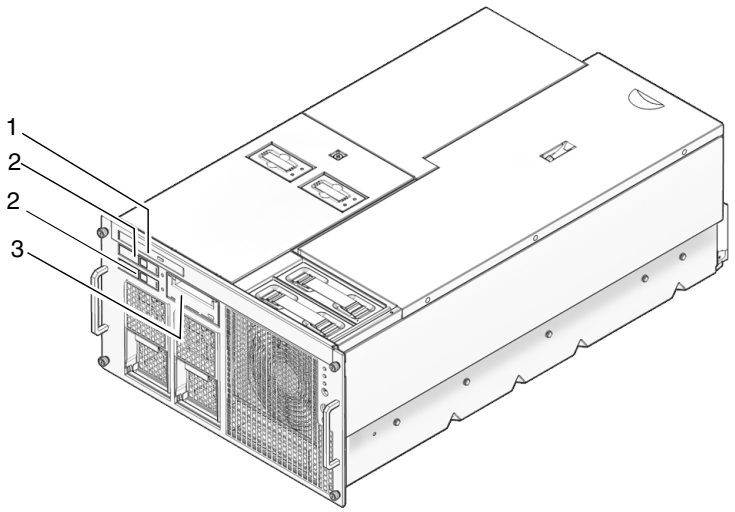
The PCIe features include a high-speed serial point-to-point interconnect. Compared with conventional PCI buses, the PCIe data transfer rates are doubled. PCI-X is the current PCI standard.

1.3.9 On-Board Drive Units

Both midrange servers provide front-panel access to the drives (FIGURE 1-20 and FIGURE 1-21). The following drives are provided on both midrange servers:

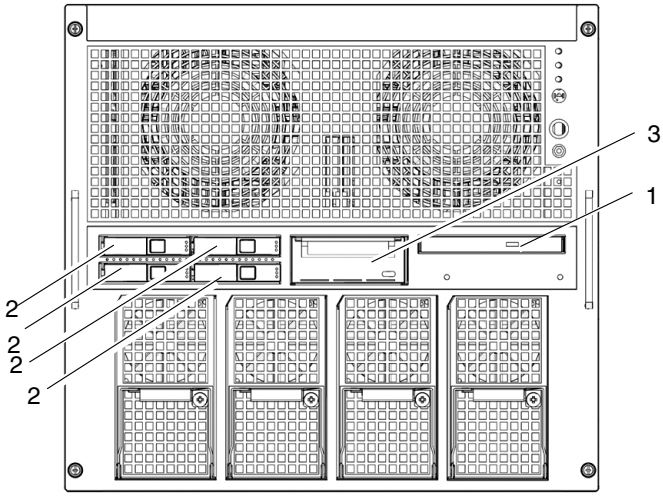
- One CD-RW/DVD-RW drive unit
- Hard disk drive
- One tape drive unit (optional)

FIGURE 1-20 CD-RW/DVD-RW Drive Unit, Hard Disk Drive, and Tape Drive Unit in the M4000 Server



Location Number	Component	Maximum Number per Server
1	CD-RW/DVD-RW drive unit	1
2	Hard disk drive, Serial-attached SCSI (SAS)	2
3	Tape drive unit	1

FIGURE 1-21 CD-RW/DVD-RW Drive Unit, Hard Disk Drive, and Tape Drive Unit in the SPARC Enterprise M5000 Server



Location Number	Component	Maximum Number per Server
1	CD-RW/DVD-RW drive unit	1
2	Hard disk drive, Serial-attached SCSI (SAS)	4
3	Tape drive unit	1

1.3.9.1 CD-RW/DVD-RW Drive Unit

TABLE 1-11 lists the features, location, and specifications of the CD-RW/DVD-RW drive unit.

TABLE 1-11 CD-RW/DVD-RW Drive Unit Features and Specifications for Both Servers

Number of CD-RW/DVD-RW drive unit	1
Location	Front of server to the right of the disk drives
Hot FRU replacement	No

The Advanced Technology Attachment Packet Interface (ATAPI) is an interface between the server and the CD-RW/DVD-RW drive unit.

1.3.9.2 Hard Disk Drive

The hard disk drives are located on the front of the midrange server. The SAS interface on the hard disk drive allows a fast data transmission rate.

1.3.9.3 Tape Drive Unit

The tape drive unit in both midrange servers is an optional component. TABLE 1-12 lists the features, location, and specifications of the optional tape drive unit.

Contact your sales representative for tape drive unit options on SPARC Enterprise M4000/M5000 servers.

TABLE 1-12 Tape Drive Unit Features and Specifications for Both Midrange Servers

Feature	Quantity, Location, and Specifications
Number of tape drive units	1 (optional)
Location	Front of server
Cold FRU replacement capability	Yes
Tape drive unit type	Digital audio tape (DAT) drive
Data transfer rate	About 6 MB/s
Capacity	36 Gbytes of data (non compressed format) 72 Gbytes of data (double-compressed format)
Media type	Sequential access
Transfer rate	150 MB/s or faster

1.4 I/O Options

1.4.1 External I/O Expansion Unit

You can purchase an optional External I/O Expansion Unit to add I/O capacity to the server. For more information, refer to the *External I/O Expansion Unit Installation and Service Manual*.

1.4.2 PCI Cards

Each PCI card in the server must be mounted to a PCI cassette before the card can be inserted into the I/O unit slot. For more information, see Section 1.3.8, "I/O Unit" on page 1-27.

1.5 Software Features

Solaris OS is installed on the system domains. In addition to its suite of software capabilities, Solaris OS provides functions that interact with system hardware.

- Dynamic Reconfiguration
- Solaris zones
- PCI hot-plug
- Capacity on Demand

Both midrange servers use the eXtended System Control Facility (XSCF) firmware. This firmware runs on the service processor and provides control and monitoring functions for the system platform.

For more information on the software features, see Chapter 3.

CHAPTER 2

System Features and Capabilities

This chapter provides information on hardware and domain configuration, resource management, and reliability, availability, and serviceability (RAS).

- Section 2.1, “Hardware Configuration” on page 2-1
- Section 2.2, “Partitioning” on page 2-5
- Section 2.3, “Resource Management” on page 2-6
- Section 2.4, “Reliability, Availability, and Serviceability” on page 2-8

2.1 Hardware Configuration

This section describes the hardware configuration. It includes these topics:

- CPU Module
- Memory Subsystem
- I/O Subsystem
- System Bus
- System Control

2.1.1 CPU Module

The SPARC Enterprise M4000 server supports up to two CPU modules and the SPARC Enterprise M5000 server supports up to four CPU modules. The CPU module consists of two processors per module. The CPU modules are high-performance multicore processor chips which contain an on-chip secondary cache to minimize memory latency. These processor chips also support the instruction retry function that enables continuous processing by retrying instructions when any error is detected.

The SPARC Enterprise M4000/M5000 servers support CPU modules that contain either two SPARC64 VI processors or two SPARC64 VII processors. A single domain can be configured with a mix of these SPARC64 processors.

Note – The new SPARC64 VII processors are supported only on SPARC Enterprise M4000/M5000 servers that run certain versions of XCP firmware (beginning with XCP 1071) and Solaris software. For specific information about these minimum software and firmware requirements, see the latest version of the Product Notes (no earlier than the XCP 1071 edition) for your server.

2.1.1.1 CPU Types and Features

This section describes the CPU types and features.

TABLE 2-1 CPU Specifications

CPU name	SPARC64 VI processor	SPARC64 VII processor
Number of cores	2 cores	4 cores
Operational mode	SPARC64 VI compatible mode	SPARC64 VI compatible mode/SPARC64 VII enhanced mode

2.1.1.2 CPU Operational Modes

Note – This section applies only to SPARC Enterprise M4000/M5000 servers that run or will run SPARC64 VII processors.

A SPARC Enterprise M4000/M5000 server domain runs in one of the following CPU operational modes:

- SPARC64 VI Compatible Mode – All processors in the domain – which can be SPARC64 VI processors, SPARC64 VII processors, or any combination of them – behave like and are treated by the OS as SPARC64 VI processors. The new capabilities of SPARC64 VII processors are not available in this mode.
- SPARC64 VII Enhanced Mode – All boards in the domain must contain only SPARC64 VII processors. In this mode, the server utilizes the new features of these processors.

By default, the Solaris OS automatically sets a domain's CPU operational mode each time the domain is booted based on the types of processors it contains. It does this when the `cpumode` variable is set to `auto`.

For more information on CPU operational modes, refer to the *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers XSCF User's Guide*.

2.1.2 Memory Subsystem

Each memory board in the server contains four or eight DIMMs (dual inline memory modules). Both midrange servers use Double Data Rate II (DDR II) type DIMMs. The memory subsystem supports up to eight-way memory interleaving for high-speed memory access. For more information on memory boards and DIMMs, see Section 1.3.3, "Memory Board" on page 1-13.

2.1.3 I/O Subsystem

Each I/O subsystem contains the following :

- PCI cards—Four short PCI Express (PCIe) slots (four upper slots) and one short PCI-X slot (lowest slot). For additional information see FIGURE 1-18 andFIGURE 1-19 .
- One I/O controller (IOC) chip, which is the bridge chip between the system bus and the IO bus
- PCI-Express switches or bridges connected to the slots

The PCI slots support the hot-plug function, which enables you to replace the IOU while the domain is operating. Before you can remove a PCI card, you must first unconfigure and disconnect it.

You can also add an optional External I/O Expansion Unit, which contains additional PCI Express slots or PCI-X slots.

2.1.4 System Bus

The CPU, memory subsystem, and I/O subsystem are directly connected to implement data transfer by using a high-speed broadband switch. Individual components are connected through tightly coupled switches, which use an even latency for data transfer. These components can be added to the server to enhance the processing capability (in proportion to the number of components added).

When a data error is detected in a CPU, Memory Access Controller (MAC), or I/O Controller (IOC), the system bus agent corrects the data and transfers it.

2.1.5 System Control

This section on system control describes XSCFU Hardware, Fault Detection and Management, and System Remote Control/Monitoring.

2.1.5.1 eXtended System Control Facility Unit (XSCFU)

The eXtended System Control Facility Unit (XSCFU), also known as the Service Processor, operates independently from the SPARC64 VI/SPARC64 VII domains. The Service Processor directs the system startup, reconfiguration, and fault diagnosis. This is where the system management software, which is the eXtended System Control Facility (XSCF) firmware, runs.

2.1.5.2 Fault Detection and Management

The XSCF firmware provides fault detection and management capabilities, such as monitoring, detecting, and reporting system errors or faults to the Service Processor. The XSCF firmware monitors the system status continuously to help the system operate in a stable condition.

The XSCF firmware promptly collects a hardware log when any system fault is detected. The firmware does the following:

- Analyzes the fault
- Determines the fault location
- Evaluates the fault conditions

As necessary, according to the fault conditions, the XSCF firmware degrades parts of domains or resets the system to prevent another fault from occurring. The firmware provides easy-to-understand and accurate information on hardware errors and fault locations. This enables you to take prompt action on faults.

For more information on XSCF fault management, refer to the *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers XSCF User's Guide.*

2.1.5.3 System Remote Control/Monitoring

The XSCF firmware provides an IP address filtering function, which permits access to XSCF and an encryption communication based on SSH and SSL. XSCF logs operator mistakes and unauthorized access attempts made during system operation. The system administrator can grant users appropriate privileges for particular tasks.

The XSCF firmware also manages user accounts for system or domain administration. The system administrator can grant users an adequate user privilege.

The XSCF firmware provides the following remote notification services:

- Notification to people of any problem that occurs (by sending email to the registered email address).
- SNMP agent function can be used for trap notification.
- Remote maintenance service can be used with the remote notification functions.

2.2 Partitioning

The SPARC Enterprise M4000 and M5000 servers can be divided into multiple independent systems for operation. This dividing function is called partitioning. This section describes features of partitioning and system configurations that can be implemented through partitioning.

The individual systems that result from the partitioning of the server are called domains. Domains are sometimes called partitions. Partitioning enables arbitrary assignment of resources in the server. Partitioning also enables flexible domain configurations to be used according to the job load or processing amount.

Each domain runs on an independent operating system. Each domain is protected by hardware so that it is not affected by other domains. For example, a software-based problem, such as an OS panic, in one domain does not directly affect jobs in the other domains. Furthermore, the operating system in each domain can be reset and shut down independently.

2.2.1 Physical Unit for Domain Constitution

The basic hardware resource making up a domain in the server is called the physical system board (PSB). The physical unit configuration of each divided part of a PSB is called an extended system board (XSB). A PSB in this server can be logically divided into one part (no division) or four parts. A PSB that is logically divided into one part (no division) is called a Uni-XSB, and a PSB that is logically divided into four parts is called a Quad-XSB. A domain can be configured with any combination of these XSBs. The XSCF is used to configure a domain and specify the PSB division type.

2.2.2 Domain Configuration

A domain is an independent computing resource that runs an individual instance of the Solaris OS. Each domain is separated from other domains, and is not affected by operations in other domains. Domains enable one server to perform different types of processing.

The operations within a domain are controlled with Solaris administration tools. However, to create, configure, and monitor domains, you must use the XSCF, as described in the *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers Administration Guide* and the *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers XSCF User's Guide.* For more background on domains, see Section 3.1.1, "Domains" on page 3-1.

2.3 Resource Management

Both midrange servers provide four means of managing the server's resources:

- Dynamic Reconfiguration
- PCI Hot-Plug
- Capacity on Demand (COD)
- Zones

2.3.1 Dynamic Reconfiguration

Dynamic reconfiguration (DR) enables hardware resources on system boards to be added and removed dynamically without stopping system operation. DR thus enables optimal relocation of system resources. Using the DR function enables additions or distributions of resources as required for job expansions or new jobs, and it can be used for the following purposes.

- Effective use of system resources – By reserving some resources, the reserved resources can be added according to changes in the workload occurring daily, monthly, or annually. This enables flexible resource allocations on the system that needs to operate 24 hours a day, every day of the year in accordance with changes in the amount of data and the workload.
- Active replacement of system resources – If a failure occurs in a CPU for a domain that has been configured with system resources of multiple system boards, the DR function enables the faulty CPU to be isolated dynamically without stopping the system. For details on DR, refer to the *SPARC Enterprise M4000/M5000/M8000/M9000 Servers Dynamic Reconfiguration (DR) User's Guide*

2.3.2 PCI Hot-Plug

You can insert and remove PCI cards for certain PCIe and PCI-X hot-plug controllers while the server is running. Before you can remove a PCI card, you must first unconfigure and disconnect it using the Solaris `cfgadm`(1M) command. For more information, refer to the *SPARC Enterprise M4000/M5000 Servers Service Manual*.

2.3.3 Capacity on Demand (COD)

Capacity on Demand is an option that allows you to purchase spare processing capacity for both servers. The spare capacity is provided in the form of one or more CPUs on COD boards that are installed on your server, but require a license to use. In other words, the COD boards themselves are free, but to use their processing capacity, you must purchase a license. Under certain conditions, you can also use COD boards as *headroom* before purchasing a license.

For more information, see the *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers Administration Guide*.

2.3.4 Zones

Solaris OS has a function called zones, which divides the processing resources and allocates them to applications. Zones provide flexible resource allocation, which enables optimal resource management with consideration given to the processing load.

In a domain, resources can be divided into sections called containers. The processing sections are allocated to each application. The processing resources are managed independently in each container. If a problem occurs in a container, the container can be isolated so it does not affect other containers.

2.4 Reliability, Availability, and Serviceability

Reliability, availability, and serviceability (RAS) are aspects of the system design that affect the ability of the system to:

- Operate without stopping
- Remain accessible and usable
- Minimize the time necessary to service the system

TABLE 2-2 defines each RAS feature.

TABLE 2-2 RAS Definitions

RAS Feature	Description
Reliability	Length of time the midrange server can operate normally without failure. The ability to detect failures with accuracy.
Availability	Ratio of time during which the system is accessible and usable.
Serviceability	Time required for the system to be recovered by specific maintenance after a failure occurs.

2.4.1 Reliability

Reliability represents the length of time the midrange server can operate normally without failure.

To improve quality, adequate components must be selected with consideration given to the product service life and the required response in case of a failure. In evaluations such as stress tests that check the service life, components and products are inspected to determine whether they meet the target reliability levels.

Reliability is equally important to both hardware and software. Naturally, trouble-free software is desired, but eliminating all software problems is difficult.

Installing the functions below leads to reliability improvements in the field.

- Cooperates with XSCF firmware to periodically check whether the software, including the domain OS, is running (host watchdog monitoring).
- Periodically performs memory patrol to detect memory software errors and stuck-at faults, even in memory areas not normally used (Memory patrol).

- Memory patrol prevents faulty areas from being used and thereby prevents the occurrence of system failures.

- Keeps checking the status of each component to detect signs of an imminent fault, such as system down occurrences. Prevents system failures (Status checking of components).

2.4.2 Availability

Availability represents the ratio of time the midrange server is accessible and usable. An operating ratio is used as an index.

Faults cannot be completely eliminated. To provide high availability, the system must be incorporated with mechanisms that enable continuous system operation even if a failure occurs in hardware, such as components and devices, basic software such as the operating system, or business application software.

The midrange servers can provide high availability by implementing the items listed below. Also, a cluster configuration can provide higher availability.

- Supporting redundant configurations and active replacement of power supplies and fans.
- Supporting redundant configurations, mirroring, and active replacement of disks.
- Extending the range of automatic correction of temporary faults in memory, system buses, and LSI internal data.
- Support of an enhanced retry function and degradation function for detected faults.
- Shortening the downtime by using automatic system reboot.
- Shortening the time taken for system startup.
- XSCF collection of fault information, and preventive maintenance using different types of warnings.
- Supporting the extended error checking and control function in the memory subsystem. The memory extended error checking and control function is an ECC code that enables correction of data from a 4-bit nibble error caused when an entire DRAM chip fails. This feature works for DIMMs employing x4 I/O DRAM.
- Supporting the memory mirroring function enables normal data processing through the other memory bus, thereby preventing system failures, in response to a DIMM stuck fault in the same memory bus.

Since the memory patrol facility is implemented in hardware, it is not affected by the software processing workload.

2.4.3 Serviceability

Serviceability represents the ease of recovery from a system failure. To facilitate recovery from a failure, after detecting the failure the system administrator and/or field engineer must do the following:

- Determine its cause
- Isolate the faulty component for replacement

The midrange server can provide high serviceability with the following features:

- Status LEDs mounted on the main components and the operator panel to display which active components need replacement
- XSCF firmware to remotely recognize the device operating status and remote device maintenance
- LED blinking function to indicate the maintenance target (CHECK-LED, which is also called the locator LED)
- Notes and cautions marked on various label types are provided for the system administrators and field engineers
- Automatic notification to report different types of faults to the system administrator and field engineers
- Centralized systematic monitoring, such as with SNMP

CHAPTER 3

About the Software

Both midrange servers include these types of software:

- Power-on self-test (POST)
- OpenBoot PROM
- Solaris Operating System software (Solaris OS)
- XSCF firmware

3.1 Solaris Operating System Software

The Solaris OS is installed on the system domains. For complete information about the Solaris OS, refer to the Solaris documentation collection. In addition to its suite of software capabilities, Solaris OS provides PCI hot-plug support, which interacts with the hardware.

3.1.1 Domains

A domain is an independent system resource that runs its own instance of the Solaris OS. Operations in one domain are not affected by operations in another domain.

Domains can be used to perform different types of processing activity. For example, one domain can be used to test new applications, while another domain can be used for production purposes.

The SPARC Enterprise M4000 system supports up to two domains and the SPARC Enterprise M5000 system supports up to four domains. A domain can be defined by using a single physical system board (Uni-XSB) or by combining resources from system boards that have been divided into separate units (Quad-XSB).

3.1.2 PCI Hot-Plug

Both midrange servers support the insertion and removal of PCI cards while the Solaris OS is running for certain PCI-Express and PCI-X slots. PCI cards must be unconfigured and disconnected using the Solaris `cfgadm`(1M) command before the cards can be physically removed. For additional information on PCI hot-plug operations, refer to the *SPARC Enterprise M4000/M5000 Servers Service Manual*.

3.2 XSCF Firmware

Both midrange servers use the XSCF firmware to manage the system. The XSCF firmware, which is preinstalled on the Service Processor at the factory, enables you to configure, manage, and maintain system components.

This section describes:

- XSCF User Interfaces
- XSCF Features

3.2.1 XSCF User Interfaces

The interface for XSCF firmware is the command-line interface (CLI), which is also called the XSCF Shell. The XSCF Shell provides the same commands as the XSCF web to configure, monitor, and maintain system resources and services. The interface can be established through a LAN connection or a serial connection.

You enter XSCF commands through a terminal on the service processor. For descriptions of the XSCF commands and how they are used, refer to these manuals:

- *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers XSCF Reference Manual*
- *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers XSCF User's Guide*
- *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers Administration Guide*

3.2.2 XSCF Features

The XSCF firmware provides commands to manage the system platform, access control, security, faults, logs, domains, and capacity on demand. Each feature is described briefly in the following sections. The XSCF firmware is preinstalled in the XSCFU at the factory. The XSCF firmware supports the following functions:

- System Management
- Security Management
- System Status Management
- Error Detection and Management
- Remote Control and Monitoring
- Configuration Management
- Capacity on Demand (COD)
- Airflow Management

3.2.2.1 System Management

The XSCF firmware, which is preinstalled, is used to manage the midrange server. The XSCF firmware also has the following remote console I/O functions for increased system availability:

- Centralized control and monitoring of the midrange server
- Hardware monitoring
- Cooling unit (fan unit) monitoring
- System status monitoring
- Fault monitoring
- Partitioning for domain configuration and management
- Monitoring the midrange server using an Ethernet connection, which enables the user to remotely manage the server
- Notifying the system administrator of fault information

3.2.2.2 Security Management

The XSCF firmware manages the XSCF firmware user accounts. The system administrator can assign the minimum required user privilege to users on as-required basis.

The XSCF firmware provides filtering that permits the IP addresses used to access the XSCF firmware and the encryption function. Access to the XSCF firmware and the encryption function is through the Secure Shell (SSH) or SSL.

Because operation failures and unauthorized accesses during system operation are logged, the system administrator can immediately use the logs to investigate the causes of unauthorized accesses.

3.2.3 System Status Management

System status management functions of the XSCF firmware include:

- Managing any faults in resources such as CPUs, memory, and I/O systems while the operating system is running
- Managing errors and faults in fans and power supply units

System configuration information, which is used by the XSCF firmware, does the following:

- Reports errors and failures
- Predicts midrange server problems
- Provides users with prompt and accurate information whenever a problem occurs

Information on system operation and errors is stored as log data on the XSCF firmware. It is used to analyze system problems. The system administrator, domain administrator, and maintenance engineer can access the log data.

The XSCF firmware promptly collects hardware error and fault information and stores it in XSCF. For information on the error messages displayed and their explanations, refer to the *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers XSCF User's Guide*.

3.2.3.1 Error Detection and Management

The XSCF firmware monitors the status of the main unit continuously to help the system operate in a stable manner. The XSCF error detection and management function does the following:

- Promptly collects a hardware log when any system fault is detected
- Analyzes the error
- Determines the error location

According to the fault conditions, the XSCF firmware implements part of domain degradation or resets the system when necessary. Easy-to-understand and accurate information on hardware errors and fault locations is provided, which enables the administrator to take prompt action.

3.2.3.2 Remote Control and Monitoring

The XSCF firmware provides the following remote notification services:

- Notifying the administrator of any problem that occurs by sending email to the specified email address.
- The SNMP agent function can be used for trap notification.
- Maintenance can be performed with the remote maintenance services.

3.2.3.3 Configuration Management

The XSCF firmware makes settings such that multiple system boards mounted in each midrange server are logically allocated to domains. One system board can be logically divided into one or four domains. The following section on Capacity on Demand (COD) explains how COD is used to manage resources.

Capacity on Demand (COD)

When COD is used, right-to use (RTU) licenses must be purchased. According to the number of RTU licenses purchased, the CPU resources must be set so that they can be used. The licenses are allocated to individual CPU resources. For details, refer to the *SPARC Enterprise M3000/M4000/M5000/M8000/M9000 Servers Administration Guide*.

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